Task-1: Job Shop Model

Total stations: 5

Machines in stations: 3 2 4 3 1

Mean time of arrival of jobs: 0.25

Type of jobs: 3

Job probabilities: 0.3 0.5 0.2

Number of stations for each task: 4 3 5

Routing and mean service time of the jobs,

Job - 1 : 3 1 2 5

0.50 0.60 0.85 0.50

Job - 2: 4 1 3

1.10 0.80 0.75

Job - 3: 2 5 1 4 3

1.20 0.25 0.70 0.90 1.00

The average total delay in the queue for each job:

|  |  |
| --- | --- |
| Job | Average Job Delay |
| 1 | 0.786 |
| 2 | 1.093 |
| 3 | 1.165 |

Average delay and number in the queues of the stations:

|  |  |  |
| --- | --- | --- |
| Work station | Average Delay in queue | Average Length in queue |
| 1 | 0.579 | 0.445 |
| 2 | 0.559 | 0.327 |
| 3 | 0.155 | 0.086 |
| 4 | 0.633 | 0.828 |
| 5 | 0.427 | 0.064 |

Average number of jobs: 15.206

Overall average delay of jobs: 1.015

We can see that the bottleneck is station 4. The average delay is larger than the others.

Task-2: Cafeteria Simulation

1. Base case

Average delays for each type of customers

|  |  |
| --- | --- |
| Hot food | 390.357 |
| Specialty sandwich | 345.376 |
| Drinks | 67.755 |

Average and the maximum length of the queues.

|  |  |  |
| --- | --- | --- |
|  | Avg | Max |
| Hot food | 114.796 | 227 |
| Specialty sandwich | 11.145 | 22 |
| Cashier | 3.401 | 11 |

Maximum number of customers : 272

Average number of customers : 136.881

Overall Delay : 3677.766

Total customers arrived : 1014

Total customers served : 113

5 employees

* 1, 1, 3

Overall Delay : 3020.083

Total customers arrived : 1218

Total customers served : 132

* 2, 1, 2

Overall Delay : 5154.322

Total customers arrived : 1216

Total customers served : 138

* 1, 2, 2

Overall Delay : 2874.73

Total customers arrived : 1162

Total customers served : 124

6 employees

* 2, 2, 2

Overall Delay : 4444.327

Total customers arrived : 1290

Total customers served : 198

* 2, 1, 3

Overall Delay : 4516.679

Total customers arrived : 1290

Total customers served : 190

* 1, 2, 3

Overall Delay : 2501.956

Total customers arrived : 1181

Total customers served : 145

7 employees

* 2, 2, 3

Overall Delay : 3783.901

Total customers arrived : 1296

Total customers served : 212

Maximum served in the combination [2, 2, 3]: 212 customers.

The lowest average delay in the combination [1, 2, 3]: 2501.956

Recommended: [2, 2, 3] => though takes one minute extra, serves a lot of customers.